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REVIEW OF RECOMMENDATIONS FOR CONSTRUCTION OF YELLOWTAIL DAM (MONTANA-WYOMING)

AND

HARDIN IRRIGATION (MONTANA) UNITS, MISSOURI RIVER BASIN PROJECT

BY

BUREAU OF RECLAMATION
DEPARTMENT OF THE INTERIOR

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FOREWORD

At the request of Senators Murray and Mansfield, of Montana, a hearing has been set for March 23–24, room 224, Senate Office Building, to review recommendations for the construction of the Yellowtail Dam (Mont.-Wyo.) and Hardin irrigation units (Montana) of the Missouri River Basin projects.

A letter from the Montana Senators dated March 7, 1955, with its attachments, outlines the respective positions of the Bureau of the Budget and the Department of the Interior, through the Bureau of Reclamation. Included also is a recommendation of May 4, 1954, by the House Committee on Interior and Insular Affairs that the two units be "immediately programed for construction."

The attachments to the letter from the Montana Senators are as follows:

Letter of January 27, 1955, from the Assistant Director, Bureau of the Budget.

Letter of December 6, 1954, from J. Carter Johnson, Billings (Mont.) Chamber of Commerce, to President Eisenhower.

Letter of November 1, 1954, from Mr. Johnson to the Director of the Budget.

Communication of February 24 of Billings (Mont.) Chamber of Commerce on Present Barriers to Construction of Yellowtail Dam.

Statements of Frank M. Clinton, regional director, Bureau of Reclamation, Billings, Mont., on Yellowtail Dam and Hardin irrigation unit before House Irrigation and Reclamation Subcommitee on April 29–30, 1954.

Resolution dated May 4, 1954, of House Committee on Interior and Insular Affairs recommending that Yellowtail Dam and the Hardin units be "immediately programed for construction," together with suggestions from the Subcommittee on Irrigation and Reclamation.

CLINTON P. ANDERSON,
Chairman, Subcommittee on Irrigation and Reclamation.

MARCH 7, 1955.

REVIEW OF RECOMMENDATIONS FOR CONSTRUCTION OF YELLOWTAIL DAM (MONT.-WYO.) AND HARDIN IRRIGATION (MONTANA) UNITS, MISSOURI RIVER BASIN PROJECT, BY BUREAU OF RECLAMATION, DEPARTMENT OF THE INTERIOR

LETTER OF SENATORS MURRAY AND MANSFIELD

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
March 7, 1955.

Hon. CLINTON P. ANDERSON,
Chairman, Subcommittee on Irrigation and Reclamation,
United States Senate, Washington, D. C.

DEAR SENATOR ANDERSON: In connection with the hearings on Yellowtail Dam, and the Hardin irrigation unit, Montana, of the Missouri River Basin project which you were good enough to set for March 23–24, the following summary of attachments is furnished for your information:

A widely circulated letter from Donald R. Belcher, Assistant Director, Bureau of the Budget, to residents of Montana in response to numerous letters and telegrams to the President, requesting the initiation of construction of Yellowtail Dam, is the immediate basis for the hearing request. It introduces the partnership idea and challenges, by indirection at least, recommendations of the Bureau of Reclamation and the Department of the Interior as to feasibility in some instances.

The response from the Bureau of the Budget was prompted by a series of letters and telegrams to the President and Bureau of the Budget from outstanding citizens of Montana, principally in the Billings area. Typical of these communications are one to President Eisenhower from J. Carter Johnson, chairman of the water resources committee, Billings Chamber of Commerce; and another to the Director of the Budget from Mr. Johnson.

Commenting on this exchange of correspondence is a communication dated February 24 from H. L. Buck, secretary-manager, to the board of trustees, Billings Chamber of Commerce, headed "Present Barriers to Construction of Yellowtail Dam."

Presented is a copy of a statement submitted at hearings before the Subcommittee on Irrigation and Reclamation of the House Committee on Interior and Insular Affairs by spokesmen for the Bureau of Reclamation, outlining the engineering, financial, and economic feasibility justification for construction of Yellowtail Dam area and the Hardin unit.

The statement concludes as follows:

The above analysis demonstrates that the Yellowtail unit is economically and financially feasible under the approved interim schedule of rates for power service in the Missouri Basin project.

A resolution adopted May 4, 1954, after hearings on April 29 and 30, by the Committee on Interior and Insular Affairs of the House of Representatives recommends that the Yellowtail Dam and Hardin units be immediately programed for construction. Suggestions from the Subcommittee on Irrigation and Reclamation were attached to the resolution.

It is our understanding that the Bureau of Reclamation, and the present Secretary of the Interior, and his immediate predecessor have repeatedly recommended initiation of construction of Yellowtail.

Congress has appropriated more than $2 million for the Yellowtail unit which have been expended by the Bureau of Reclamation for investigations and advance planning.

Progress is being made, we are advised, in negotiations for an agreement with the Crow Indian Tribe for rights-of-way for Yellowtail Dam. An up-to-date report on these negotiations would be informative.

It is suggested that you may desire to request the presence at the hearing of the Director of the Budget, the Secretary of the Interior, the Commissioner of Reclamation, the regional director of the Bureau of Reclamation at Billings, Mont., as well as any other persons who you feel may aid in a comprehensive review of the Yellowtail Dam and Hardin units of the Missouri River Basin project as the basis for an appropriate resolution of the Senate Committee on Interior and Insular Affairs.

Sincerely yours,

JAMES E. MURRAY, *Chairman.*
MIKE MANSFIELD.

LETTER FROM ASSISTANT DIRECTOR OF THE BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C., January 27, 1955.

To Chamber of Commerce, Billings, Mont.

GENTLEMEN: The President has referred to us numerous letters and telegrams received from residents in the Billings area requesting the initiation of construction of the Yellowtail Dam project in Montana.

The President's 1956 budget message to the Congress emphasized that achievement of resource development basic to the economic progress and security of the Nation requires encouragement of local, public, and private initiative. The President has referred on numerous occasions to the need for creating a spirit of cooperation between Federal and non-Federal interests in the construction of water resources projects. He believes that where non-Federal groups are willing to undertake such developments, either on their own responsibility or in partnership with the Federal Government, they should be encouraged and supported in doing so.

We believe that the possibility of local participation in the construction of the Yellowtail Dam has not been fully explored. If a satisfactory partnership project can be developed, authorizing legislation similar to that proposed in the 1956 budget for several other partnership projects will be submitted to the Congress.

Furthermore, our review of the Federal project as presently contemplated indicated that to provide for the repayment of the power investment would require power rates higher than those now prevailing in the area.

In view of the foregoing circumstances, the project was not included in the 1956 budget.

The number of telegrams and other communications that we received from the Billings area indicated the amount of interest in this project. Because of this interest, I hope that you can give the contents of this letter as widespread publicity as possible in the Billings area.

Sincerely yours,

DONALD R. BELCHER,
Assistant Director.

LETTER TO THE PRESIDENT

BILLINGS CHAMBER OF COMMERCE,
December 6, 1954.

To the Honorable DWIGHT D. EISENHOWER,
The White House, Washington, D. C.

MR. PRESIDENT: As chairman of the water resources committee of the Billings Chamber of Commerce, I am writing to you concerning the Yellowtail Dam on the Big Horn River. This dam, authorized under the Reclamation Act of 1944, has most of the preliminary work completed, but has received no appropriation in recent years to carry on this project.

I wired you in Denver asking that you pass over this area when en route to Missoula. We also attempted to arrange to have Mr. Nixon stop at Miles City, pick up 6 or 8 from Billings and Hardin, and fly over the dam site, but this failed in the last few hours before his arrival.

* * * The economic and engineering facts can be secured from the hearings of the Committee on Interior and Insular Affairs of the House of Representatives, held April 29 and 30, 1954.

It is earnestly hoped that you, Mr. President, will ask the Bureau of the Budget to press for an appropriation on this project.

* * * * * * *

We trust that you will find it possible to give this your sincere consideration and action.

Respectfully,

J. CARTER JOHNSON,
Chairman, Water Resources Committee.

LETTER TO DIRECTOR OF THE BUDGET BUREAU

BILLINGS CHAMBER OF COMMERCE,
Billings, Mont., November 1, 1954.

Mr. JOSEPH M. DODGE,
Bureau of the Budget,
Executive Office Building, Washington, D. C.

DEAR MR. DODGE: The time is fast approaching when the 1956 budget will be taking final form and we of eastern Montana hope that the Yellowtail Dam project has proper appraisal. This appraisal is of no small matter to a very patriotic part of these United States, and is with a thorough understanding that economy in government is important, that a balanced budget is most desirable, and that the taxpayers' dollars should be well and intelligently expended.

It is this last phase that mostly concerns us of eastern Montana and northern Wyoming; we feel that money can be spent as an investment in all of the United States in providing for the national defense and for peacetime economy. We maintain the construction of Yellowtail Dam will be an advantage to the country as a whole; and, if properly engineered, nearly every dollar will go into actual construction. There are no roads, railroads, or towns to be transplanted and no valuable land submerged—actually an investment in irrigation and power with every dollar expended.

Nowhere is there a more natural site for a dam and the energy produced therefrom in more immediate demand. It will also provide an agriculture that

can be fashioned to the demand economy rather than just wheat as now farmed and which is in surplus. Irrigation makes for an elastic agriculture which can be fitted to the needs and requirements of our Nation. By the time this can all be accomplished, a period of perhaps 5 or 6 years, the local demand will have become acute if normal progress is maintained and present development continues.

Today the Army, Navy, and Air Force, as well as planes, ships, and munitions, are foremost in the minds of the people. I well remember the statement of General Von Hindenburg at the close of World War I: "It was not alone your well-equipped armies and gallant men, but the efficiency of the American farmer that won the war."

Let us get started on this project because it can provide not only for an efficient agriculture but also power for manufacturing, a decentralization of industry which is only good sense in view of today's method of warfare.

In conclusion, may I state that the importance of this project is not sectional—it is national in importance and scope, an important investment in reclamation and power that will eventually return to the Treasury the moneys spent in its construction. Therefore, may we impress upon your committee the importance of including a substantial sum to get this project on its way.

We thank you for this decision of consequence.

Very truly yours,

J. CARTER JOHNSON,
Chairman, Water Resources Committee.

COMMENTS OF BILLINGS (MONT.) CHAMBER OF COMMERCE

BILLINGS CHAMBER OF COMMERCE,
Billings, Mont., February 24, 1955.

To the Board of Trustees:

Herewith is a report on my activities in connection with promotion of the Yellowtail Dam project:

PRESENT BARRIERS TO CONSTRUCTION OF YELLOWTAIL DAM

The Billings Chamber got an answer, last week in Washington, to the January telegram campaign requesting President Eisenhower to include the Yellowtail Dam for construction in his budget message. The answer took the form of several added barriers, from the Bureau of the Budget, to getting this project started.

Stated briefly, the facts are: The President, last June, included the Yellowtail Dam in a proposed supplemental budget message to the Congress. The Bureau of the Budget raised objections to the project and (apparently with Presidential approval) eliminated the project from the supplemental budget message.

The telegrams and letters received in January were referred to the Budget Bureau, with instructions to inform the senders why the project was not included for an appropriation.

The reasons (not heretofore raised with the local chamber) given to the chamber of commerce are as follows:

(*a*) "We believe that the possibility of local participation in the construction of the Yellowtail Dam has not been fully explored. If a satisfactory partnership project can be developed, authorizing legislation similar to that proposed in the 1956 budget for several other partnership projects will be submitted to the Congress."

(*b*) "Furthermore, our review of the Federal project as presently contemplated indicated that to provide for the repayment of the power investment would require power rates higher than those now prevailing in the area."

Questioning of the Assistant Director, Budget Bureau, developed that agency's interpretation of how these barriers may be eliminated.

For local participation, it proposed the Department of the Interior seek a partner in one of several private power companies in the area. This could place responsibility upon the local group for building transmission lines, installing the generating equipment—any part, or all, of the facilities for generating and distributing the power to be generated at the dam.

Estimated savings in investment of funds by the Government of from $24 million up to $90 million.

Failure to produce such a participating partner would mean a resurvey of the project must be made by the Bureau of Reclamation seeking lower costs for the project, which must be accomplished before the project can be submitted to Congress.

The Budget Bureau, in this interview, made no reference to the problem of securing right-of-way from the Indians. The Committee on Interior and Insular Affairs of the House of Representatives holds [1] "that title to reservoir sites should be obtained before construction is initiated."

HEARING REQUESTED IN UNITED STATES SENATE

Your chamber representative with the Montaina Water Board agent in Washington then requested the Senate Committee on Interior and Insular Affairs, of which Senator James E. Murray is chairman, to set a hearing on this matter at an early date at which the Bureau of the Budget and Bureau of Reclamation officials should present their respective views and data bearing on the Budget Bureau proposals.

The Budget contention that the Reclamation Bureau's plans and proposals for the project are not realistic might be better evaluated from the material submitted for the record at the hearing.

The House of Representatives Committee on Interior and Insular Affairs, last May 4, by resolution, recommended that the Yellowtail and Hardin units of the Missouri River Basin project be immediately programed for construction.

Respectfully submitted.

H. L. BUCK, *Secretary-Manager.*

GENERAL STATEMENT, YELLOWTAIL UNIT, MONTANA AND WYOMING, LOWER BIGHORN DIVISION, MISSOURI RIVER BASIN PROJECT

(Submitted by Frank M. Clinton, regional director, Bureau of Reclamation, Billings, Mont., to House Irrigation and Reclamation Subcommittee, April 29–30, 1954)

Yellowtail unit, comprising the dam, reservoir, and powerplant, is a multiple-purpose development which would provide for conservation, control, and use of Bighorn River flows at the site. The dam site is located at the mouth of Bighorn Canyon in south-central Montana, 40 miles south of Hardin, Mont. The reservoir lies astride the Wyoming-Montana State line.

The unit is a key structure in a comprehensive plan of development of the Missouri River Basin project to be constructed, operated, and maintained by the Bureau of Reclamation under authority of section 9 of the Flood Control Act of 1944 (58 Stat. 887) and Senate Document 191, as modified by Senate Document 247, both 78th Congress, 2d session.

Primary purposes of the unit are irrigation, power production, and flood control. Other incidental uses to which important benefits attach are silt retention, improvement of fish and wildlife resources, and recreation. In addition it will facilitate administration of the Yellowstone River compact and contribute to a more uniform and desirable flow in the lower Yellowstone River Valley.

PREVIOUS INVESTIGATIONS

Previous studies and reports of a water-resource development in this area are: (*a*) Investigations by the Reclamation Service during 1903–05 for gravity diversion near the Yellowtail Dam site to a canal system along the west side of the river. (*b*) Investigations started in 1913 and a detailed report dated October 24, 1917, for the Bighorn Canyon Irrigation & Power Co., prepared by A. W. F. Koch, proposing the construction of a gravity arch dam of rubble concrete about 480 feet high and powerplant with 500 miles of transmission line and 62 miles of highline canals to irrigate 60,000 acres of benchland. (*c*) A report on the Bighorn Canyon irrigation and power project by G. W. Goethals, consulting engineer of New York City, dated May 16, 1917, propounding the economic practicabilities of the proposal. (*d*) A survey report, Yellowstone River, Wyo., Mont., and N. Dak., by the Corps of Engineers dated March 31, 1932, later pub-

[1] See item 6 in memorandum transmitted with resolution of May 4, 1954.

lished in House Document 256, 73d Congress, 2d session. (*e*) Bureau of Reclamation investigations of the Yellowtail Dam and Reservoir sites 1939–42 (project investigations report No. 81) later summarized and published in Senate Document 191, 78th Congress, 2d session, proposing a low dam at the Yellowtail site and one at the Kane site to be operated in conjunction with a combined total installed capacity of 105,000 kilowatts. (*f*) review report on flood control and other purposes, Yellowstone River and tributaries, Wyoming, Montana, and North Dakota, in 1946 by the Corps of Engineers based on House Document 256. (*g*) definite plan report, Yellowtail unit, dated January 1950 (approved by the Commissioner, November 10, 1950) based on further detailed investigations, concludes that a single high dam at the Yellowtail site is more economical than the two dams at the Kane and Yellowtail sites.

ORIGINAL PLAN (S. DOC. 191)

The plan of development for the lower Bighorn River Basin, presented in Senate Document 191, consisted of two reservoirs requiring comparatively low dams and irrigation of Hardin Bench. One of the dams was to be at the upper end of the Bighorn Canyon near Kane, Wyo., and one at the present Yellowtail Dam site near the mouth of the canyon. The two reservoirs, with storage capacities of 750,000 and 470,000 acre-feet respectively, were to be operated in conjunction to provide for irrigation, power, silt retention and flood control. Powerplant capacities were to be 30,000 kilowatts at Kane and 75,000 kilowatts at Yellowtail.

Pertinent information on the two dams is:

	Kane	Yellowtail
Hydraulic height	143	370
Crest length	600	1,100
Type of construction	(1)	(2)

[1] Concrete, gravity.
[2] Concrete, arch.

The principal reason for selection of 2 reservoirs rather than 1 larger reservoir at the Yellowtail site was because reconnaissance information indicated a possibility of excessive leakage into the cavernous limestone forming the canyon walls. Sufficient funds were not available at that time to resolve this question by drilling and tunneling.

PRESENT PLAN

Subsequent explorations and detailed studies led to the conclusion that a larger reservoir at the Yellowtail site would hold water without excessive leakage. Detailed topographic surveys also disclosed an error of 15 feet in the datum from which elevations were taken for the original surveys of the two sites. Correction of this error resulted in reducing the capacity of the Kane site from 750,000 acre-feet to 610,000 acre-feet.

A reservoir at the Kane site would flood considerably more land in Wyoming and would require much more extensive highway and railroad relocations.

Comparative studies indicated that a combination of two dams would cost about $5 million more than a high dam at the Yellowtail site and annual costs would be more for the 2 structures rather than the 1. Consequently, the high dam at the Yellowtail site was adopted.

Detailed studies have led to adoption of reservoir capacities as follows:

Purpose:	*Volume (acre-feet)*
Flood control	259,000
Joint use, flood and conservation	250,000
Conservation	358,000
Minimum operating storage	508,000
Total	1,375,000

About 95,000 acre-feet of the conservation storage capacity is needed for irrigation of the Hardin unit.

The dam will be a concrete arch structure with the following dimensions:

	Feet
Structural height	518
Hydraulic height	494
Crest length	1,445

The spillway is a reinforced concrete structure with two 50-foot by 61.66-foot radial gates discharging into a 41-foot horseshoe section tunnel with a capacity of 173,000 cubic feet per second. The outlet works consist of two 84-inch diameter pipes, one for irrigation releases and the other for evacuation of the reservoir, each controlled by an 84-inch hollow jet valve after a 48-inch ring follower gate. With the water surface elevation at 3,547 feet the capacities of the irrigation outlet and the evacuation outlet are 3,460 and 3,580 second-feet, respectively.

An afterbay will be provided to smooth out diurnal fluctuations in river flows caused by powerplant releases. The afterbay dam is located 2.25 miles downstream from Yellowtail Dam site. It will be an earthfill and concrete structure with an ogee spillway, 201.5 feet long, controlled by 7 radial gates, and will provide reregulation and replacement diversion for the existing Bighorn Indian service canal. The dimensions are:

	Feet
Structural height	36
Hydraulic height	31
Crest length	1,320

The powerplant will be located on the toe of Yellowtail Dam and will have four units each with 50,000-kilowatt capacity. The maximum net head will be 459 feet.

Normal power marketing considerations would call for a powerplant at Yellowtail Dam with an installation of about 130,000 kilowatts. However, peaking power is at a premium in the Missouri River Basin system. Due to the high head and short penstocks, Yellowtail powerplant afforded an ideal opportunity for a peaking plant. Design of the powerplant, therefore, was based on operating the reservoir at sufficiently high levels to assure full peaking capacity from the powerplant at practically all times. Consideration of anticipated drawdown periods and their diversity with other reservoirs, together with probable excess capacity inherent in most turbine and generator manufacture, led to a decision that the powerplant machinery should be rated to produce the full 200,000 kilowatts only down to an operating head of 420 feet. Operation studies show that the head was permitted to be less than 420 feet only 3 times in a study period of 24 years, and the minimum head reached was 370 feet for a period of less than 1 month.

COMPARISON OF PLANS

A comparison of pertinent items of the plan presented in Senate Document 191 and the presently planned Yellowtail unit is:

	S. Doc. 191			Presently planned, Yellowtail
	Kane	Yellowtail	Total	
Hydraulic height of dam, feet	143	370		494
Total storage capacity, acre-feet	610,000	470,000	1,080,000	1,375,000
Powerplant capacity, kilowatts	30,000	75,000	105,000	200,000
Annual generation [1], kilowatt-hours	124,000,000	401,000,000	525,000,000	597,000,000

[1] Firm power with full upstream development.

PRESENT STATUS

Detailed studies have been continued since preparation of the definite plan report sufficient to permit advertising for bids on the access road and prime contract within 3 months after construction funds are made available.

The Bureau of Reclamation has expended a total of $2,533,000 to date in the engineering investigations relating to the Yellowtail unit.

Investigations completed since those leading to findings presented in S. D. 191 are:

Topographic surveys of Yellowtail Dam and Reservoir area; afterbay dam and reservoir area; borrow pit areas and the campsite location.

Explorations include about 19,000 feet of diamond drill holes, 1,500 feet of exploration tunnels, and 39 test pits.

Detailed studies were made for water supplies, power production, and flood control. In addition, detailed design studies have been made for the dam and powerplant, including trial-load analysis of the dam. Laboratory model studies have been made of the spillway and outlet works.

In addition, about 5 miles of (jeep) trail were constructed in the vicinity of the dam site to facilitate investigations.

The Lovell-Yellowtail 115-kilovolt transmission line, which will provide power during dam construction and later for transmission of power to the Bighorn Basin in Wyoming, has been partially completed. Due to a lack of funds construction on this line was suspended last summer.

LAND REQUIRED FOR DAM AND RESERVOIR

The site selected for the Yellowtail Dam and powerplant is located near the northerly end of the Bighorn Canyon. The reservoir area extends upstream from the site in a southerly direction and is, for approximately two-thirds of its length, within the confines of the canyon. A short distance south of the Wyoming-Montana State line, the canyon terminates and the reservoir spreads over farmlands of the Bighorn River Basin. At the extreme southerly end of the reservoir, the town of Kane, Wyo., will require relocation and the grade of the Chicago, Burlington & Quincy Railroad will require raising.

One of the major problems of acquiring lands needed for reservoir rights-of-way relates to lands owned by the Crow Indian Tribe. From the Montana-Wyoming State line northward for about two-thirds of the distance to the dam site, the Bighorn River marks the westerly boundary of the Crow Indian Reservation. At that point, the boundary of the reservation extends in a westerly direction so that for the remainder of the distance to the dam site the reservoir area and the dam site are on Tribal Indian lands.

All other lands required for the reservoir, not within the reservation, are held in private ownership or are public domain or State-owned lands.

The following table shows the distribution of lands required between the various classes of holdings:

	Acres
Tribal Indian lands	6,997
Private lands	10,770
State lands	2,486
Public domain	10,604
Total	30,857

Approximately 42 percent of the land required for the reservoir is located in Montana and 58 percent is located in Wyoming.

Following numerous conferences with representatives of the Crow Tribe and the Bureau of Indian Affairs, it became apparent that the usual rules for evaluation of the taking of property for public purposes would not be satisfactory in determining the value of the Tribal Indian lands required for the dam site and the reservoir. Consequently, it was agreed that the element of power site value would have to be considered.

Field forces of the Bureau of Indian Affairs and the Bureau of Reclamation collaborated in studies of the value of the tribal Indian lands required for the dam and reservoir. The area director of the Bureau of Indian Affairs and the regional director of the Bureau of Reclamation, following these studies, mutually concluded and recommended to their superiors that the Secretary of the Inte-

rior offer to the Crow Tribe of Indians $1,500,000 for the tribal Indian lands required. This amount recognizes the element of power-site value but it also recognizes that the Crow Tribe is not the sole owner of all the lands required for the reservoir.

The Secretary of the Interior has made the offer of $1,500,000 to the Crow Tribe but the tribe has, through action of its tribal council, refused the offer.

CONSTRUCTION COSTS

During the past year a revised design has been completed and a new cost estimate prepared, based on specification quantities, which reflect the result of 3 years of detail design studies. These detailed studies resulted in modifications and refinements in design which reduced the previous estimate for the dam $7,601,000, the powerplant and switchyard $10,490,000, and general property $1,560,000. The detailed studies reduced the concrete volume of the dam some 570,000 cubic yards while those on the powerplant reduced the physical size of the powerhouse, turbines, and generators. The new official estimate for the Yellowtail unit is $95,721,000 exclusive of transmission facilities beyond the switchyard.

Yellowtail Dam and Reservoir (includes right-of-way and associated relocations)	$67,239,000
Yellowtail afterbay dam	1,585,000
Yellowtail powerplant	21,294,000
Yellowtail switchyard	2,579,000
General property	2,524,000
Recreational facilities	500,000
Total	95,721,000

It is anticipated that it would take about 6 years to complete construction of the dam, powerplant and appurtenant structures. Under an economic construction schedule, required appropriations would be about as follows:

1st year	$9,000,000	4th year	$25,000,000
2d year	19,000,000	5th year	11,000,000
3d year	25,000,000	6th year	4,188,000

Of the amounts given $2 million would be required for right-of-way the first year and $500,000 the second year.

PLANT CAPABILITY AND POWER PRODUCTION

In planning Yellowtail powerplant, it was recognized that an installation of about 130,000 kilowatts would probably be sufficient to assure the sale of the firm energy available. It was evident, however that the Yellowtail plant, due to the high head available and the economic advantage of installing short penstocks, afforded an ideal site at which to install additional generating capacity to assist the integrated power system in the production of salable firm energy. Some of the energy produced by other prospective powerplants will not fit under the firm power load curve of the integrated system and would necessarily be sold only for its off-peak energy value. The additional assured capability at Yellowtail permits the sale of much of this type of energy as firm power over the interconnected system.

Design of the powerplant was based on operating the reservoir at sufficiently high levels to assure full peaking capacity from the powerplant at practically all times. Consideration of anticipated drawdown periods and their diversity with other reservoirs, together with probable excess capacity inherent in most turbines and generators, led to a decision that the powerplant machinery should be rated to produce the full 200,000 kilowatts only down to an operating head of 420 feet. Operation studies show that the head might be less than 420 feet only three times in a study period of 24 years, and the minimum head reached was 370 feet for a period of less than 1 month.

Initially, it is expected that the powerplant will produce about 875,200,000 kilowatt-hours annually, of which, about 650 million kilowatt-hours will be firm energy. After ultimate upstream depletions for irrigation, estimated to be experienced about 50 years after initial generation, power production is estimated

to be about 761 million kilowatt-hours annually, of which, about 597 million kilowatt-hours will be firm energy. Average annual power production for the first 50 years of operations will, therefore, be about 818,100,000 kilowatt-hours, of which, about 623,500,00 kilowatt-hours will be firm energy.

Since power produced at Yellowtail will be marketed on the interconnected projects power system, generation will be integrated with the energy produced at other powerplants. Deducting for average transmission losses, about 185,000 kilowatts of power will be available for sale at the loads, along with an estimated average annual firm sale of 576,738,000 kilowatt-hours and an average annual nonfirm sale of 180 million kilowatt-hours. These estimates represent salable energy at loads on the integrated power system.

POWER MARKETING

The marketing area.—The principal area in which power produced at the Yellowtail powerplant will be marketed comprises northern Wyoming, Montana east of the Continental Divide, and portions of western and northwestern North Dakota, as shown on the attached map. By virtue of existing and proposed interconnections between the major Bureau transmission systems it will also be possible to utilize Yellowtail power in augmenting power supplies in southern Wyoming and in the eastern portion of the Missouri River Basin.

Agriculture, mining, and industry are economic activities of the primary market area. In recent years the production, transportation, and refining of petroleum has assumed major proportions and its rapid expansion is continuing. Northern Wyoming has long been a substantial oil producing area, and the Williston Basin, a large part of which is located within the market area for Yellowtail power, promises to become one of the major oil producers in the Nation.

A large variety of minerals occurs, chiefly in the mountainous portions of the West. Coal reserves, for the most part subbituminous, are distributed broadly over the area. Favorable sites for synthetic liquid fuel plants offer prospects for large power loads. Natural gas reserves are substantial.

Power requirements and supply.—In analyzing the present and future power requirements and supply in the Yellowtail market area use was made of the report, Power Requirements and Supply, Missouri River Region, prepared by the Subcommittee on Electric Power of the Missouri Basin Interagency Committee. This report, published in May 1953, represents the coordinated efforts of representatives of investor-owned, municipal, public power, rural electric, and Federal utility systems, and is used as an impartial source of data in the ensuing presentation.

Present (1953) power requirements in the area, excluding exports, but including reserve requirements, are stated in the report as 517 megawatts. Adding export commitments of 60 megawatts, a total requirement of 577 megawatts results, which is somewhat in excess of the effective generating capability in the area, amounting to 532 megawatts. The deficit is presently met by imports of power from southern Wyoming and Colorado, and by reliance on power supplies in western Montana outside the marketing area. Generating capacity, except for the 66,000-kilowatt steamplant at Billings, Mont., is located around the periphery of the area and therefore is not easily integrated. Integration is further limited by lack of transmission interties between the power systems in Montana and Wyoming. The Yellowtail powerplant, by virtue of its central location and associated transmission lines would provide means of integrating the existing systems.

The estimated future power requirements of the Yellowtail market area, together with estimated generation, are shown in the following tabulation for the years 1960, 1965, and 1970. These requirements are based on a very conservative load growth of 5 percent annually over the 17-year period, as estimated in the report. Commitments for export of power outside the marketing area are assumed to be five megawatts higher than at present.

This tabulation shows a need for additional power within the marketing area amounting to 138 megawatts in 1960, 264 megawatts in 1965, and 405 megawatts in 1970. On the above basis of power requirements, there should be a ready market for the output of at least three units of the Yellowtail powerplant by 1960 with the fourth unit required about 1 year later.

Estimated future power requirements of Yellowtail market area

[Data from Power Requirements and Supply, Missouri River Region, Missouri Basin Inter-Agency Committee, May 1953]

	Megawatts			Megawatt-hours		
	1960	1965	1970	1960	1965	1970
Peak load of area	696	846	1,028	3,737	4,489	5,324
Export commitment	65	65	65	285	285	285
Reserve	57	58	59			
Load plus reserve	818	969	1,152	4,022	4,774	5,609
Generating capability other than Yellowtail:						
Non-Federal, hydro	245	245	245	1,491	1,491	1,491
Non-Federal, fuel	205	230	272	1,344	1,512	1,790
Federal, hydro	230	230	230	1,594	1,510	1,507
Total capability	680	705	747	4,429	4,513	4,788
Additional firm supply required	138	264	405	(407)	261	821

FLOOD CONTROL

Storage requirements for flood control were established by the Corps of Engineers and set forth in a memorandum report. They concluded that 250,000 acre-feet of space reserved solely for flood control, and another 250,000 acre-feet of space to be used jointly with conservation purposes, would fulfill the flood control needs. In designing the reservoir, the above amounts of storage, plus an additional 9,000 acre-feet, were provided for the flood control function. Operation studies show that this 509,000 acre-feet of flood storage capacity would control all floods of record to safe channel capacity. It would also control the reservoir design flood, having a total volume of 2,044,000 acre-feet and peak discharge of nearly 60,000 cubic feet per second, to a maximum outflow of 20,000 cubic feet per second. The Corps of Engineers have estimated that flood control benefits will average $210,000 annually from operation of the reservoir.

RECREATION

The National Park Service has studied the proposed Yellowtail Reservoir area and has concluded that, because of its outstanding scenic character and excellent fishing potentialities, it is expected to influence a sizable area in southern Montana and northern Wyoming. The primary zone of interest is estimated to comprise and area within an average distance of about 50 miles from the shore of the reservoir. The cities included in this area, particularly Billings, Mont., have grown considerably since 1940, and it is believed that upon completion of the reservoir the population of the region in general will expand when full benefits from irrigation and power are realized. Primary annual benefits of about $109,000 would accrue from an estimated expenditure of $500,000. Over a 50-year period this annual amount, capitalized at 2½ percent, would amount to about $3 million.

FISH AND WILDLIFE

The Fish and Wildlife Service has studied the Yellowtail and Hardin units and has embodied its findings in a report on Fish and Wildlife Resources in Relation to the Water Development Plan for the Hardin Unit, Bighorn River, Mont. and Wyo., dated June 1948. That agency concluded that after development, limited areas of the reservoir should be attractive to aquatic animals. The potential fishery of the reservoir will be greatly increased if access to the reservoir margin can be facilitated. The development as planned will be beneficial to fish and wildlife. Annual benefits to these resources from development of Yellowtail unit are estimated to be $50,400.

SEDIMENT CONTROL

Both the Wind River Basin and the central Bighorn Basin are prolific sources of sediment. Erosion is more apparent in the southeastern portion of the drainage basin and in other localized areas where barren wastelands or badlands appear.

The average annual sediment estimate of 5,600 acre-feet at Thermopolis was taken as the inflow to Boysen Reservoir, since the intervening canyon contributes very little sediment. The trap efficiency of Boysen Reservoir is estimated at 95 percent or about 5,300 acre-feet. Deduction of this amount from the estimate of 9,100 at Kane, and addition of 750 acre-feet for the Shoshone River, gives an average annual inflow of 4,550 acre-feet to the Yellowtail Reservoir.

Practically all of the silt entering the reservoir will be retained. In a period of 100 years about 455,000 acre-feet of silt would be deposited in the reservoir. Much of this sediment would be deposited in the 508,000 acre-foot inactive portion of the reservoir. About 69 years would elapse before sediment will begin to impair the use of the reservoir.

The Bighorn River is the heaviest contributor of silt in the Yellowstone River Basin. Construction of the reservoir will make a large contribution to clearing up the lower Yellowstone River. There are 201,140 acres now irrigated from the Yellowstone and Bighorn Rivers below Yellowtail Dam site, and an additional 61,340 acres of new irrigation is contemplated in the Yellowstone Valley. Large amounts of silt are carried into the irrigation systems, and considerably more expense is experienced in cleaning canals than would be necessary if the silt load in the river were reduced. Construction of Yellowtail Reservoir should alleviate this situation and result in a considerable saving in operation and maintenance costs to irrigators.

EFFECT ON DOWNSTREAM RIVER FLOWS

A reservoir at the Yellowtail site offers a physical solution to the interstate water problem on the Bighorn River and would afford a practical solution to administration of the Yellowstone River compact as it applies to the Bighorn River.

The more uniform river flows that operation of Yellowtail Reservoir would produce in the Bighorn and Yellowstone Rivers would facilitate irrigation diversions and result in a lower cost of maintenance of structures on or along those rivers.

ALLOCATION OF COST

Inasmuch as Yellowtail is one unit of a comprehensive basin development, it is necessary to include costs of related transmission facilities to make the necessary allocations of costs and financial evaluations. These costs are summarized as follows:

Yellowtail unit	$95,721,000
Transmission division	24,494,000
Total construction cost	120,215,000

During the past decade various methods have been used in making allocations of cost. Several of these methods have been used on Yellowtail unit, with varying results. During the past month the Department of the Interior prescribed the separable costs-remaining benefits method as being preferable. This method is approved by the Federal Interagency River Basin Committee. In applying this method of allocations, the following single-purpose alternatives were assumed:

Power.—A privately financed steam plant with a capacity of 180,000 kilowatts, located in the vicinity of Forsyth, Mont.

Irrigation.—A reservoir at the Yellowtail site with a total capacity of 550,000 acre-feet; 95,000 acre-feet of active capacity for irrigation and 455,000 acre-feet for silt accumulation.

Flood control.—A reservoir at the Yellowtail site with a total capacity of 955,000 acre-feet; 500,000 acre-feet for flood control and 455,000 acre-feet for silt accumulation.

Application of the separable costs-remaining benefits method results in the following allocation of construction costs:

Irrigation	$26,552,000
Power	67,203,000
Flood control	4,241,000
Recreation [1]	500,000
Total	98,496,000

[1] Cost of facilities only.

Total power costs are:

Power allocation, Yellowtail unit	$67,203,000
Transmission division	24,494,000
Total	91,697,000

It is estimated that about 25 percent of the kilowatt installation of the Missouri River Basin project will be needed for irrigation pumping, the cost of which is noninterest bearing. Applying this factor, the following breakdown of power costs is obtained:

Interest bearing	$68,773,000
Noninterest bearing	22,924,000

Capitalized net benefits or justifiable investment for flood control amounted to $5,806,000 as compared with the allocation of $4,241,000.

POWER PAY OUT

In order to demonstrate financial feasibility of the Yellowtail unit power development a pay-out study has been prepared on a 50-year basis, exclusive of basinwide project relationships, except that the transmission facilities and power output are considered as being integrated into the interconnected power system. The pay-out study is inserted at the end of this statement.

The investment components of the power development include the capital costs allocated to power at site and a proportionate amount of the interconnected project transmission system based upon the ratio of installed generating capacity at Yellowtail to total system capacity. This investment was suballocated into interest-bearing commercial electric plant and non-interest-bearing irrigation electric plant in accordance with the use estimated to be made of system power capacity by commercial and irrigation demands respectively, or 75 percent to the former and 26 percent to the latter.

For purposes of determining the disposition of energy, the average annual ultimate firm energy generation of Yellowtail, after allowance for transmission losses, was divided in accordance with the basinwide average into firm commercial and irrigation pumping sales. Thus, 12.7 percent of total firm energy was assigned to irrigation pumping sales.

The approved interim schedules of rates for wholesale firm power service for the Missouri River Basin project have been used in the study. This schedule of rates requires payment of a capacity charge of $0.75 per month per kilowatt of billing demand, or $9 per kilowatt per year, and a monthly energy charge of 3.5 mills per kilowatt-hour for the first 250 kilowatt-hours per kilowatt of billing demand and 3 mills per kilowatt-hour for the balance used. Under this schedule of rates, the total charge averages 5.5 mills per kilowatt-hour at 50 percent load factor. However, inasmuch as the Yellowtail powerplant is designed to provide system peaking and consequently has a higher kilowatt installation that normally required to dispose of the firm energy, it is assumed that all firm energy will be sold under the 3.5 mill block of the schedule of rates. The revenues for firm energy were therefore calculated on the basis of $9 per kilowatt and 3.5 mills per kilowatt-hour.

The capital and annual repayment obligations for the Yellowtail unit were divided so as to recognize the Hardin unit irrigation costs which would obtain under alternate plans of development. The most economical plan for providing irrigation water would be by gravity diversion from the Yellowtail Reservoir. This plan would reduce total power production from that attainable under the proposed plan whereby maximum utilization of falling water would be achieved

by running all water through the powerplant and then pumping the irrigation water back to the required elevation for diversion. The latter plan proved most economical from an overall standpoint and was selected. However, irrigators were considered obligated only to the extent of those lesser costs which might have been incurred by the gravity diversion method. In the proposed plan, an amount of $2,775,000 was added to the separable power capital costs representing the excess capital costs of the pumping installation over gravity diversion costs. Also for the same reason, an operation and maintenance differential of $35,200 was added to annual power costs, and pumping energy sales were reduced by $44,300, the amount required to pump water into the West Canal for the Hardin unit.

Estimated reimbursable power development costs

Separable costs		$34,666,000
Powerplant	$21,294,000	
Switchyard	2,579,000	
Afterbay Dam	1,585,000	
Other separable costs	6,433,000	
Hardin unit pumping plant differential	2,775,000	
Transmission system [1]		24,494,000
Allocation of joint costs		32,537,000
Total power costs		91,697,000
Less 25 percent for interest-free investment		22,924,000
Commercial electric plant investment		68,773,000

[1] Proportionate share of Missouri River Basin project transmission system.

Estimated annual operating costs

Operation and maintenance:	
Specific power, including transmission	$561,950
Joint works, allocated to power	9,330
Hardin unit operation and maintenance differential	35,200
Total operation and maintenance	606,480
Replacement reserves:	
Specific power, including transmission	468,824
Joint works, allocated to power	25,253
Total replacement reserves	494,077

Financial feasibility summary

Gross revenue		$208,970,550
Revenue deductions:		
Operation and maintenance	$30,787,660	
Replacement reserve	25,075,575	
Subtotal deductions		55,863,235
Net operating revenues		153,107,315
Commercial power investment	68,773,000	
Interest charges	45,311,695	
Subtotal		114,084,695
Net surplus in 50 years after meeting requirement of repayment of commercial power investment		39,022,620
Interest-free investment in Yellowtail unit (suballocation of power costs to irrigation)		22,924,000
Net surplus in 50 years after meeting requirements for repayment of total power investment		16,098,620
Interest charges collected		45,311,695

CONCLUSION

The above analysis demonstrates that the Yellowtail unit is economically and financially feasible under the approved interim schedules of rates for power service in the Missouri River Basin project.

General Statement, Hardin Unit, Montana, Lower Bighorn Division, Missouri River Basin Project

(Submitted by Frank M. Clinton, regional director, Bureau of Reclamation, Billings, Mont., to House Irrigation and Reclamation Subcommittee, April 29–30, 1954)

The Hardin unit comprises about 45,800 acres of benchlands just downstream from Yellowtail Dam in Bighorn County in south-central Montana in the vicinity of Hardin. Unit lands are shown in yellow and existing irrigated lands are shown in green on both the attached map and display chart.

Of the 45,800 acres, 44,000 acres are new lands and 1,800 acres are now irrigated from Soap Creek, an eastern tributary to Bighorn River, by an inadequate supply. About 40,000 acres lie on the west side of the valley and 5,800 acres lie on the east side of the valley.

PROJECT WORKS

The presently contemplated plan for serving irrigation water to these arable lands contains the following main features: Hardin pumping plant, West Canal, East Canal, War Man relift pumping plant, and War Man Canal.

Hardin pumping plant.—The pumping plant will be located on the left bank of the Bighorn River just below the mouth of the Bighorn Canyon, about 1 mile below Yellowtail Dam site. The plant will contain electric motor-driven pumps, with a total capacity of about 1,095 cubic feet per second pumped against a static head of about 90 feet. The intake for the pumps will be located in the backwater of the Yellowtail (Lime Kiln) Afterbay Dam, which reregulates the flows released from Yellowtail Dam.

West Canal.—The West Canal originates at the discharge end of the Hardin pumping plant and will extent along the west side of the Bighorn River for a distance of about 70 miles to serve an area of about 40,000 acres of benchland. Most of the lands to be served by this canal lie in a continuous strip 2 to 4 miles in width and about 42 miles in length. The canal will have an initial capacity of about 1,100 second-feet. Canal excavation will be mostly in earth and the principal structures will include 2 siphons and 3 major drops.

East Canal.—The East Canal takes off from the main or West Canal a few hundred feet below the end of the Hardin pumping plant discharge line, crosses the Bighorn River by an inverted siphon, then traverses about 10 miles eastward, furnishing water to about 2,100 acres of irrigable benchland above the existing Bighorn Canal. East Canal terminates at Soap Creek, but will discharge sufficient water into that creek to supplement the supply to about 1,800 acres with a supplemental water supply. Water destined for lands under War Man Canal are transported by the East Canal to the War Man relift pumping plant located beyond the discharge end of the siphon across the Bighorn River. The lands to have new irrigation under this canal are within a compact area lying a short distance below the mouth of Bighorn Canyon.

War Man pumping plant and canal.—War Man pumping plant relifts water from East Canal through a static head of about 60 feet to War Man Canal, which traverses eastward about 5 miles furnishing a full irrigation supply to about 1,900 acres of arable land lying between War Man and East Canals.

In addition to the works described lateral and drainage systems will be provided.

It should be recognized that the above-described plan for irrigation of the lands in the unit is based largely on a reconnaissance survey. When more detailed land classification surveys and engineering studies of alternate layouts of the canal system are completed, it may be found economical to include a somewhat larger acreage of land by locating the West Canal on grade through a greater portion of its length.

CONSTRUCTION COST

The estimated cost of construction of the distribution system for the Hardin unit, at January 1954 prices, is as follows:

Hardin pumping plant	$5,021,000
War Man pumping plant	146,000
Hardin canals and conduits	3,314,000
Hardin laterals	2,597,000
Hardin drains	2,436,000
Farm unit development	210,000
Total	13,724,000

Of the above costs, only those on Hardin pumping plant were based on feasibility standards, the remainder being reconnaissance type. More detailed investigation will brobably reveal deficiencies in the estimate as well as more economical means of providing service; however, the above estimate is representative of the anticipated costs of construction for the entire distribution system as now laid out.

WATER SUPPLY

The annual irrigation requirement at the point of diversion for the irrigable lands of the Hardin unit is estimated to be 3.8 acre-feet per year, for a total diversion requirement in a dry year of about 170,00 acre-feet.

The Bighorn River is the only practicable source of water for irrigation of the Hardin unit. With full upstream development, as now contemplated, an active storage capacity of 95,000 acre-feet would be required to furnish Hardin unit lands with a full water supply without adverse effects on senior downstream water rights. Regulation afforded by Yellowtail Reservoir would be more than ample to provide these storage water needs.

LAND RESOURCES

Investigations of land resources to date consist of a soil survey made in 1938 under the auspices of a Montana Agricultural Experiment Station, Corps of Engineers, and the Bureau of Plant Industry, a reconnaissance land classification completed by the Bureau of Reclamation in 1939 and a deep-pit study made in 1952. These investigations and observations, substantiated by laboratory tests, clearly indicated the adequate arability of the lands of the Hardin unit.

Soils are quite variable, ranging from a heavy clay loam in the lower areas to a sandy loam in the upland areas. The greater part of the unit area is underlain with gravel at depths of 4 feet or more. Soil characteristics are quite favorable to sustained irrigation agriculture.

Drainage.—The pit study, conducted in 1952, consisted of 115 holes to determine if any serious drainage problems might exist with application of irrigation water. Based on the results of this study, it is the consensus of qualified personnel that no serious drainage problem should develop.

Land certification.—At the present time there is insufficient data available to make the certification as to the adequacy of soil survey and land classification, which is now required by permanent legislation.

AGRICULTURAL ECONOMY

Present situation.—Irrigation in the lower Bighorn Valley is already well advanced and irrigation practices have been established.

At the present time, there are 5 direct diversions from the Bighorn River below Yellowtail Dam serving irrigation water to approximately 43,000 acres. The combined ultimate irrigable acreage under existing works is estimated to be about 53,700. Upland benches are mainly dry farmed, and the remainder of the area is used for grazing.

Ninety percent of the lands comprising the Hardin unit are devoted to dryland wheat, and 10 percent to grazing. Summer fallowing is practiced extensively. Production on lands cropped varies from a high of about 27 bushels of wheat per acre in the most favorable years to a low of about 4 bushels per acre in drought years. Average annual yield is 13 bushels per acre. Carrying capacity of the grassland is estimated to be 30 acres per head for year-round grazing.

In 1949, the Hardin unit area was divided among 22 operating units, varying greatly in size. Four of the largest operators controlled about 28,000 acres. About 27,000 acres of the unit lands are Indian owned; all of these lands have been allotted.

Anticipated situation.—An irrigated agricultural economy similar to that on existing irrigation projects along the lower Bighorn, Little Bighorn, and lower Yellowstone Rivers is expected to develop from the Hardin unit. With full development of the unit lands, about 290 new family-sized farms would be available. Production on these farms is expected to follow closely the pattern prevailing on nearby irrigated projects with similar climatic conditions. The principal crops to be grown would be alfalfa, sugar beets, barley, wheat, corn, and oats. Gross farm income of about $84 per acre is anticipated, which is an increase of $73 per acre over the present situation. This is based upon the anticipated long-range price level and the practice of 50 percent summer fallow for wheat production in the present situation.

Due to the large surrounding area of grazing land, the general area is devoted largely to production of grass-fattened cattle. Feed production is now pretty much in balance with carrying capacity of grazing land. Irrigation of the unit lands could provide feed to fatten about 19,500 beef cattle annually in the area, which would reduce the number of feeders now shipped out by about 40 percent.

In addition, transportation facilities are good and a modern sugar-beet factory is located at Hardin. These factors would be conducive to diversified cash crop production if desired. Byproducts from sugar-beet production would fit well into feeding enterprises.

Another result of irrigation is that it would reduce the area devoted to wheat from about 40,000 acres to 5,000 acres.

ANNUAL COSTS

Annual costs assignable to the Hardin unit include operation, maintenance, and replacement costs of the irrigation system, and an appropriate share of annual operation, maintenance, and replacement costs of Yellowtail Dam and Reservoir allocated to irrigation.

The pumping plan of diversion was adopted because increased power generation more than justified the increased costs over the gravity diversion. Annual operation, maintenance, and replacement costs to be paid by the irrigators are the same as would be required for the gravity diversion.

Annual operation, maintenance, and replacement costs assignable to the Hardin unit on the basis of present costs are estimated as follows:

	Per acre
Canal, lateral, and drainage systems	$2.00
Diversion works and canyon conduit	.44
Yellowtail Dam and Reservoir	.35
Total	2.79

Long-time average annual costs are considered to be 72 percent of present costs, making the anticipated annual operation, maintenance, and replacement costs of the Hardin unit $2 per acre.

ALLOCATION OF COSTS

Construction costs assignable to the Hardin unit include the cost of the irrigation system plus the allocation of construction costs of Yellowtail Dam and Reservoir to irrigation.

As the pumping plan of diversion was adopted rather than the gravity plan because of benefits to the power system, only the costs equal to those for the gravity diversion are to be assigned to the irrigation system. The pumping plan costs $2,775,000 more than the gravity diversion. Consequently, the cost of the irrigation system for Hardin unit is allocated as follows:

Power	$2,775,000
Irrigation	10,949,000
Total	13,724,000

Total costs allocated to the Hardin unit are:

Irrigation system	$10,949,000
Yellowtail Dam and Reservoir	26,552,000
Total allocation to irrigation	37,501,000

Costs allocated to irrigation amount to $819 per acre.

IRRIGATION PAYOUT

The average annual payment capacity of lands comprising the Hardin unit has been estimated on a conservative basis at $6 per acre for new lands and $5 per acre for lands to receive supplemental water. With an average annual operation, maintenance, and replacement cost of $2 per acre this leaves $4 per acre to apply on repayment on new lands, and $3 per acre for supplemental lands.

Allowing a 10-year development period before repayment charges begin and a 40-year repayment period, a total of $7,256,000 would be repaid by the landowners. This would leave $30,245,000 to be returned from power revenues from the Missouri River Basin power system.

RESOLUTION OF HOUSE INTERIOR AND INSULAR AFFAIRS COMMITTEE

Whereas the Bureau of the Budget, the Department of the Interior, and the House Appropriations Committee have indicated their wish that there be a review of the major units of the Missouri Basin project, authorized under the 1944 Flood Control Act, before construction is initiated;

Whereas the Yellowtail unit and the Hardin unit are integrated and authorized parts of the Missouri Basin project;

Whereas the Yellowstone River compact was negotiated and approved by the States of Montana, Wyoming, and North Dakota on the basis that the Yellowtail Dam and Reservoir would be constructed;

Whereas hearings were held April 29 and 30, 1954, before the House Subcommittee on Irrigation and Reclamation, and the economic and engineering feasibility of the Yellowtail and Hardin units were found to be adequate and sound;

Whereas the hearings established the fact that the following desired the construction of the projects:

Frank M. Clinton, regional director, Bureau of Reclamation, Billings, Mont.; accompanied by John R. Walker, regional power manager, Bureau of Reclamation, Billings, Mont.
Colin Raff, executive assistant, the Montana Power Co., Butte, Mont.
H. W. Bunston, Billings, Mont.
L. Roy Cool, district agriculturist, Holly Sugar Corp., Hardin, Mont.
Henry S. Ruegamer, president, Bighorn County Chamber of Commerce, Hardin, Mont.
George Hogan, Jr., member of the Crow Tribe of Indians, State of Montana.
J. Carter Johnson, chairman of the water resources and Yellowtail Dam committee of the Billings Chamber of Commerce.
Herbert L. Buck, secretary-manager, Billings Chamber of Commerce, and secretary-treasurer, National Reclamation Association.
Fred Buck, Yellowstone River Compact Commission.
Frank Stermitz, chairman, Yellowstone River Compact Commission.
State Board of Montana, State Water Conservation Board, Helena, Mont.
Buffalo Rapids Project, Montana
Hysham Water Users Association, Hysham, Mont.
President, Tongue River Water Users Association, Broadus, Mont.
Glendive Chamber of Commerce, Glendive, Mont.
Board of Control, Lower Yellowstone Project, Sidney, Mont.
Montana-North Dakota Beet Growers Association, Montana
Sidney Chamber of Commerce, Sidney, Mont.
Sheridan Chamber of Commerce, Sheridan, Mont.
Laurel Commercial Club, Laurel, Mont.

George Lackmann, president, Montana State Rural Electric Cooperative Association, Inc., Montana
Wyrulec Company REA, Lingle, Wyo.
Sheridan-Johnson Rural Electrification Association, Tri-County Electric Association, Inc., Sundance, Wyo.
Niobrara Electric Association, Inc., Lusk, Wyo.
Mid-Yellowstone Electric Cooperative, Hysham, Mont.
REA Bark Electric Cooperative, Livingston, Mont.
Fergus Electric Cooperative, Lewistown, Mont.
Yellowstone Valley Electric Cooperative, Huntley, Mont.
Merrill E. Shoup, president, Holly Sugar Corp., Colorado Springs, Colo.

Whereas opposition to the project is composed of a minority of the Crow Indians on whose reservation the units will be partially located;

Whereas products raised on the irrigation projects will be principally hay, sugar beets, and feed grains, which will not contribute to the surplus foods; and

Whereas witnesses testified that there will be a market within the service area of the Yellowtail unit for all electricity to be generated at a rate that will pay out the unit with interest in less than 50 years and provide a surplus for application to irrigation costs: Now, therefore, be it

Resolved, That the Committee on Interior and Insular Affairs of the House of Representatives recommends that the Yellowtail and Hardin units of the Missouri River Basin project be immediately programed for construction; and be it further

Resolved, That a copy of this resolution be transmitted to the Director, Bureau of the Budget, the Secretary of the Interior, and the chairman of the House Appropriations Committee.

Approved by the Committee on Interior and Insular Affairs of the United States House of Representatives this 4th day of May 1954.

A. L. MILLER, *Chairman.*

Attested:
ORLAND T. HUYCK,
Chief Clerk.

SUGGESTIONS OF IRRIGATION-RECLAMATION SUBCOMMITTEE

In transmitting this resolution the Subcommittee on Irrigation and Reclamation would like to make the following suggestions:

1. Witnesses for the Bureau of Reclamation testified that storage was to be provided in the Yellowtail Reservoir for a flood that could be expected to occur only once in 30 years. With two major storage reservoirs on the river it appears that these reservoirs could be so regulated as to meet the threat of flood once in 30 years, thereby saving about $4 million in the construction cost of the reservoir.

2. The Bureau of Reclamation proposes to construct a transmission line to Lovell, Wyo., a distance of 200 miles, to obtain power for construction of the project. It appears that tie-ins with existing transmission lines could be made at Hardin or Billings, a distance of 40 miles, thereby making a substantial saving in construction costs.

3. Bureau of Reclamation estimate includes $24.5 million for transmission line construction. The possibility of tieing in to existing transmission lines at Hardin or Billings under a wheeling agreement should be explored. Such tie-ins might result in substantial savings in construction costs. Possibility of the rural electric association or private power company installing the generating, switchyard, and transmission facilities should be explored, thus saving the advance of about $90 million from the Federal Treasury.

4. The Bureau of Reclamation plans for the Yellowtail unit include pumps to lift water from the river below the powerplant into the Hardin canal after the water has gone through the generators. The committee is not convinced that the income from the additional power generated by this use of water will equal the additional irrigation cost and suggests further study to determine whether or not a gravity canal out of the reservoir would not, over a period of 50 years, result in less cost.

5. The Hardin project cost estimate contains $2,436,000 for construction of drains. The necessity of this item is questioned. The area to be irrigated is on a sloping bench underlaid with gravel. A cost of over $50 per acre under these circumstances seems unwarranted.

6. This committee has long been of the opinion that title to reservoir sites should be obtained before construction is initiated. This is especially important in the construction of the Yellowtail unit as the chairman of the Crow Tribal Council testified that a suit would be brought to block the construction of the unit. It is therefore recommended that immediate steps be taken to reach a settlement with the Crow Tribe in accordance with the opinion of Interior Department Solicitor Clarence Davis dated February 3, 1954, and in accord with the letter of Fred Aandahl, Assistant Secretary of the Interior, dated January 6, 1954, both of which are a part of the record.

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